Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech (Fifth Semester - Regular) Examinations, November – 2024

22BELPC35003/22BEEPC35003 – Signals & Systems

(EE/EEE)

Time: 3 hrs   Maximum: 70 Marks

Answer ALL questions
(The figures in the right hand margin indicate marks)

PART – A   **(2 x 5 = 10 Marks)**

Q.1. Answer *ALL* questions

		CO #	Blooms Level
a.	State the final value theorem with regard to Z-transform.	CO2	K1
b.	What is the difference between Power & Energy Signals?	CO1	K2
c.	Write 2- similarities and differences in convolution and correlation of two sequences.	CO3	K2
d.	Define FIR and IIR systems.	CO2	K1
e.	Define scaling property in Z-transform.	CO5	K2

PART – B   **(15 x 4 = 60 Marks)**

Answer *ALL* the questions

		Marks	CO #	Blooms Level
2. a.	Determine whether the following system is Static/ Dynamic, Causal/ Non-causal and Stable/unstable. $y(n) = nx(n)$	8	CO2	K3
b.	Two sequences $x_1(n)$ and $x_2(n)$ are given as $x_1(n) = \left\{2,1,2,1\right\}$ and $x_2(n) = \left\{1,2,3,4\right\}$, find the circular convolution of the above two sequences.	7	CO3	K3

(OR)

		Marks	CO #	Blooms Level
c.	Determine whether the following system is Linear/ Non-linear and Shift Invariant/ Shift Variant and Stable/Unstable. $y(n) = x(2n)$	8	CO2	K3
d.	Find the linear convolution $g(n) = x(n) * h(n)$ of two discrete-time sequences which are given by $x(n) = \left\{1,1,0,1,1\right\}$, $h(n) = \left\{1,-2,-3,4\right\}$	7	CO3	K4
3.a.	Perform cross-correlation $r_{xy}(m)$ of two sequences using tabular method $x(n) = \left\{1,1,2,2\right\}$ and $y(n) = \left\{1,3,1\right\}$	8	CO4	K4
b.	x(t) = 10cos100 π t If the sampling frequency is 75Hz, find the discrete-time equivalent of the signal x(n) also find an alias frequency corresponding to Fs = 75Hz.	7	CO2	K3

(OR)

c.	Define auto-correlation and cross-correlation of sequences. Perform the auto-correlation $r_{xx}(m)$ of sequence $x(n) = \{1,2,3,4\}$	8	CO4	K3
d.	Construct the block diagram & signal flow graph of the discrete time system whose input output relation is described by the difference equation	7	CO2	K2

d. Construct the block diagram & signal flow graph of the discrete time system whose input output relation is described by the difference equation

y(n) = 0.25y(n-1) + 0.5x(n) + 0.75x(n-1)

4.a. Let $x(n) = \left(\frac{1}{2}\right)^n u(n) + \left(\frac{1}{4}\right)^n u(-n-1)$ 8   CO5   K5

Find the Z-transform and RoC of X(z)

b. Find the initial and final values of the corresponding sequence $x(n)$ 7   CO5   K3

Given by $X(z) = 2 + 3z^{-1} + 4z^{-2}$

<div align="center">(OR)</div>

c. Determine the Z-transform of $x(n) = (n-3)u(n)$ 8   CO5   K3

d. Find the initial and final value of the following Z-domain signals.   7   CO5   K3

$$X(z) = \frac{2z^{-1}}{1 - 1.8z^{-1} + 0.8z^{-2}}$$

5.a. Determine the inverse Z-transform of the function by Cauchy's integral method.   8   CO5   K5

$$X(z) = \frac{z^2 + z}{(z-2)^2}$$

b. The transfer function of an LTI system is $H(z) = \frac{z-1}{(z-2)(z+3)}$, Determine the impulse response.   7   CO5   K4

<div align="center">(OR)</div>

c. Find the inverse Z-transform of $X(z) = \frac{0.25z^{-1}}{(1-0.5z^{-1})(1-0.25z^{-1})}$ 8   CO5   K5

When (i) RoC is $|z| > 0.25$ (ii) RoC is $0.25 < |z| < 0.5$

d. Solve the discrete time system described by difference equation   7   CO3   K3

$$x(n+2) + 3x(n+1) + 2x(n) = 0$$

Given the initial conditions $x(0) = 0$ and $x(1) = 1$

<div align="center">--- End of Paper ---</div>